

Federal Republic of Germany

German Patent office

5

Utility Model

10 (11) Register number G 90 050626.4
(51) Main class B26B 21/38
(22) Filing date May 17, 1990
15 (47) Registration date August 9, 1990
(43) Publication in Patent Gazette September 20, 1990
20 (54) Description of object Wet razor with replaceable razor blade
(71) Name and address of the owner Keller, Hans W., Dipl.-Phys. ETH, Winterthur, CH
25 (74) Name and address of the representative Andrae, S., Dipl.-Chem. Dr. rer. nat., 8000 Munich; Flach, D., Dipl.-Phys., 8200 Rosenheim; Haug, D., Dipl.-Ing., 7320 Göppingen; Kneßl, R., Dipl.-Chem. Dr. rer. nat., patent lawyers, 8000 Munich

5 Wet razor with replaceable blade

10

The invention relates to a wet razor with replaceable razor blade according to the preamble of claim 1.

15 Wet razors comprising a razor handle or razor shaft, a razor neck and a razor head are well known. In the past individual razor blades were attached to the razor head while today's razor blades are often integrated into a replaceable plastic element that is attached to an appropriate mounting element on the wet razor's razor neck by an articulated link. No-tilting replaceable razor heads with integrated blade arrangements and even systems
20 with double blades are also known.

Electrically operated dry razors are also well known and very popular on the market but many customers still prefer wet razors which are not only significantly less expensive compared to electric dry razors but often also allow a smoother and closer shaving.

25 The object of the invention is to improve the conventional wet razor in such a way that the shaving and cutting result is further improved. Furthermore, in a preferred embodiment of the invention, the device offers better ease of use.

30 This object is achieved in the invention according to the features listed in claim 1. Advantageous embodiments of the invention are listed in the sub-claims.

35 The invention accomplishes a wet razor system with significant better cutting effect while applying minimal pressure to the skin, thus making shaving extremely gentle. The principle of the wet razor system according to the invention is based on a vibrating or oscillating arrangement causing the razor blade to vibrate. It is possible to achieve any vibration pattern and, if desired, superimposed oscillations in order to optimize the cutting and shaving result even further.

40 According to the invention the vibration of the razor blade is generated by a piezoceramic element, in particular a piezoceramic patch, that is either firmly attached to and replaceable with the blade, or is firmly integrated into the razor head, in which case the replaceable razor blade is to be attached at least indirectly to this piezoceramic element or patch. An integrated oscillator circuit generates the vibration of the piezoceramic patch according to the actuating surfaces in such a way that the razor blade above it performs
45 the same vibrations precisely, thereby optimizing the shaving process.

The cutting effect of the blade is thus significantly improved by these usually high frequency vibrations.

5 As aforementioned, the piezoceramic element generating the oscillation can be an integrated element of the wet razor. An exchangeable razor blade is then at least indirectly attached to it.

10 However, in a preferred embodiment the piezoceramic patch is, together with a razorblade, integrated into a replaceable element and can be replaced together with the razor blade onto the razor head.

In this case the one piece element, consisting of the razor blade and the piezoceramic patch, is mounted to the remaining wet razor on a plug-in basis, i.e. an appropriate

15 interface where this socket joint provides not only a fixed mechanical plug-in connection but also an electrical plug-in connection for at least two electrical wires activating the piezoceramic patch.

20 The oscillating circuit to activate the razor patch is preferably housed inside the razor handle together with a replaceable battery or rechargeable miniature battery.

The ease of use is further improved by adding a sensor, preferably on the razor handle, so that the razor blade starts vibrating as soon as the razor is taken into the hand. The sensor can be preferably a infrared sensor or, for example, a pressure sensor.

25 Such an infrared or pressure sensor can also be integrated in the area of the razor blade itself. This offers the additional advantage that the sensor only turns on when the razor blade is placed against the skin and is turned off as soon as it is no longer touching the skin. This allows for improved energy efficiency.

30 Another possibility is a humidity sensor on the razor head. In this case oscillation starts as soon as the resistance between the two conducting contacts is decreased through contact with water.

35 Additional advantages, details and features of the invention are detailed in the following exemplary embodiments by means of drawings. Shown are:

in figure 1: a schematic side view of the wet razor according to the invention, partly in section;

40 In figure 2: extract of an alternative embodiment to figure 1.

The drawings show a wet razor with a razor head 1, an adjacent razor neck 3 and a razor shaft or handle 5.

Into the razor shaft or handle 5 a battery or rechargeable miniature battery 7 is inserted replaceably. After replacing usually the bottom part of the razor handle is closed again, which is not further illustrated.

5 Furthermore, an oscillating circuit 9 (only schematically shown) is housed in the razor handle 5. Its function is described in a later part.

Moreover, a sensor 11 is placed on the razor handle 5, so designed that the device is activated and operated by the sensor as soon as the razor head is taken into the hand.

10 The electrically working Sensor 11 can here be an infrared sensor which activates the oscillator circuit as soon as a hand on the sensor emits infrared radiation. In this case the casing of the razor handle 5 is made at least in this region from infrared penetrable material.

15 As an alternative Sensor 11 can be in form of a pressure sensor which switches the razor head on with even minimal pressure.

20 The razor head 1, shown in cross section, comprises in practical use usually a cover 13, made of plastic, from which the edge 15 of a razor blade 17 projects to the front.

25 In the shown exemplary embodiment a piezoceramic patch 19 is integrated at the bottom of the razor blade 17 and thus firmly attached to the razor blade 17. Parallel to the front edge 15, i.e. perpendicular to the drawing plane, an actuating surface 21, also perpendicular to the plane of the razor blade 17, is provided on both sides of the piezoceramic patch 19, on the side of the edge 15 and on the back side away from the edge. From both conducting actuating surfaces 21 one connecting wire 23 and 25 each lead to the oscillator circuit 9 via an interface 27.

30 The interface 27 is to be designed in an appropriate way, preferably as a plug-in connection to which the razor head 1 with the two connecting wires 23 and 25 is to be mounted on the razor neck 3. Thus a firm mechanical connection and a wire plug-in connection for the two connecting wires 23 and 25 is created through which an electrical connection to the connecting wires 23' and 25' in the razor neck 3 and the razor shaft 5 respectively can be established.

When taking the wet razor into the hand the oscillator circuit 9 is automatically activated, for example by the mentioned infrared sensor 11, and switched to ON.

40 By means of the oscillating electrical fields created on the actuating surfaces 21 mechanical changes are caused in the crystal material of the piezoceramic patch 19, so that sufficiently strong vibrations can be produced with this so called electrostriction. The vibration frequencies can be chosen from a wide range for optimal function, preferably in the ultrasound range above 16kHz or even 20 kHz etc. In particular when the frequency 45 of an applied alternating current corresponds to the mechanical natural frequency of the

crystal body, especially pronounced mechanical vibrations can be achieved which are directly transferred to the razor blade 17 by means of the piezoceramic patch 19.

5 Generally the vibration amplitudes are perpendicular to the strength of the electric field so that the razor blade in the shown exemplary embodiment, for example, can be caused to vibrate up and down in direction of the arrow 29, fluctuating rapidly, thus improving the shaving results.

10 It is also possible to arrange the actuating surfaces 21 differently on the piezoceramic element 19, or the piezoceramic patch can have a different polar axis allowing the generation of any other kind of vibrations.

15 Moreover, several preferred pairs of actuating surfaces 21 with different orientations can be provided, especially when the piezoceramic material has more than one polar axis, in order to create superimposed, more complicated vibration patterns for an easier shaving process.

20 Especially in this case more than two connecting wires 23 and 25 can be provided to activate the different actuation surfaces 21 separately in such a way that they create a specific electrical field.

When the wet razor is put down the infrared sensor 11 immediately recognizes the decrease in temperature and switches the device off.

25 Furthermore an adjustment control can be provided which allows the setting of the reaction characteristics of the infrared sensor 11 to different temperatures.

Moreover, a pressure sensor could be provided.

30 Moreover, it has to be mentioned that the infrared or, for example, pressure sensor can also be provided at the razor head 1 or near to it; for example even integrated into the interface 27, so it reacts to the change of pressure in the shaving process, for example when placing the razor blade on the skin, and activates the oscillator circuit 9. An additional advantage here is that the oscillator circuit 9 is only switched on for a short time during the actual shaving process on the skin, and is afterwards immediately switched off, thus reducing the usage of battery power.

40 Moreover, it has to be mentioned that the interface 27 can also be placed at another location, for example in the razor neck 3 or even in the region of the razor handle 5, or at the transition from the razor neck 13 to the razor handle 5. The attachable head element needs to be designed accordingly.

45 Moreover, it is possible, as shown only schematically in figure 1, to provide a humidity sensor 11' instead of infrared or pressure sensors, at least when designed in the area of the razor head 1. Oscillation begins as soon as the resistance between the two conducting

contacts is decreased through contact with water. The connection of the humidity sensor 11' is accomplished by connecting wires which are not shown in detail.

Referring to figure 2, it is only shown schematically that the actual razor head 1 can be
5 also designed as a variation from figure 1 in such a way that it essentially comprises only
the razor blade 17 and, if needed, a connection adapter 31 to firmly mount it to the
remaining wet razor. In this case only the razor blade 17 is replaced after a certain time.
Its connection adapter 31 comprises, for example, a plug-in or clip closure guard which
can be attached to the remaining razor head 1 in such a way that the actual razor blade 17
10 is at least indirectly immediately connected to the piezoceramic patch 19 and can be
caused by it to vibrate. In figure 2 the connection adapter 31 comprises at least two
locking pins, arranged behind each other along the razor blade 17, which are also passed
through the piezoceramic element 19 by means of openings and fastened with a
detachable snap-on connection, not shown in detail. In this embodiment no electrical
15 connections for connection wires 23 and 25, for example in form of plug-in connections,
are necessary. In the shown exemplary embodiment the razor head therefore consists of
two parts with the cutting and separation line 27 dividing part 1' and 1".

Moreover, it is possible to provide an electric connecting wire instead of the replaceable
20 battery 7, or exchangeable with it, to also run the wet razor from a power outlet.
Especially when a rechargeable battery or rechargeable miniature battery is used, a coil of
a transformer can be integrated, in particular inside the razor handle 5, so that the entire
arrangement is entirely encapsulated and protected from moisture. A entirely
25 encapsulated second coil, connected to the power outlet, can be integrated into a receptor
and holding carrier, not described in detail, so that, when the wet razor is put down so
that the transformer coil of the wet razor is directly adjacent to the second coil in the
receptor and holding carrier a full transformer step for recharging the accumulator is
possible.
30 Instead of the piezoceramic patch 19 an electromagnetic vibration generating system, in
particular an electromagnetic coil or miniature coil system, can be provided that is, as
described, either an integrated part of the wet razor and not removed when the blade is
replaced, or an integrated component of a replaceable razor head 1 or a part 1' of a razor
head 1 with a razor blade 17 that is always also replaced by means of the interface 27.

Claims:

1. Wet razor with replaceable razor blade, wherein, by means of an actuated vibration head, a razor blade (17) is caused to oscillate, whereas the vibration head is preferably made from a piezoceramic element (19) or an electromagnetic actuator, in particular a coil or a miniature coil actuator.
2. Wet razor as claimed in claim 1, wherein the piezoceramic element (19) consists of a piezoceramic patch.
3. Wet razor as claimed in claim 1 or 2, wherein the razor blade (17) is firmly attached to the piezoceramic element (19) as an integrated unit and replaced together with it.
4. Wet razor as claimed in claim 3 with the razor head (1) being mounted replaceably to the remaining wet razor, wherein the razor blade (17), together with the firmly attached piezoceramic patch (19), can be replaceably mounted to the remaining wet razor as part of the razor head (1).
5. Wet razor as claimed in one of the claims 1 to 4, wherein an interface (27) is provided to mount the razor blade (17) replaceably together with the firmly attached piezoceramic element (19) on the remaining wet razor which comprises a mechanical fastener and an electric contact for activation of the piezoceramic elements (19).
6. Wet razor as claimed in claim 5, wherein the electrical connection has two contact or plug-in connections, electrically connecting at least two connection wires (23, 25) from the piezoceramic element (19) with the respective connection wires (23', 25') in the remaining wet razor.
7. Wet razor as claimed in claim 5, wherein an interface (27) between the razor blade (14) with the integrated piezoceramic element (19) and the remaining wet razor is provided, running across the razor head (1) at the transition from the razor head (1) to the razor neck (3), the razor neck (3) at the transition from the razor neck (3) to the razor handle (5), or the razor handle (5), preferably in the junction area, to the razor neck (3).
8. Wet razor as claimed in claim 1 or 2, wherein an interface (27) for replacing the razor blade (17) is provided between the razor blade (17) and the piezoceramic element (19), wherein the mounted razor blade (17) is at least indirectly connected to the piezoceramic element (19) to be actuated and caused to vibrate, and wherein the razor blade (17) preferably is part of an replaceable razor head (1).
9. Wet razor as claimed in claim 1 to 8, wherein the piezoceramic element (19) has at least two actuating surfaces (21) to create vibration.

10. Wet razor as claimed in claim 9, wherein more than two actuating surfaces (21), preferably at least four or at least six actuating surfaces (21), are provided in order to create superimposed vibration patterns.
- 5 11. Wet razor as claimed in claim 1 to 10, wherein, preferably inside the razor handle (5), an electrically activated oscillator circuit (9) is provided to actuate the piezoceramic element (19).
- 10 12. Wet razor as claimed in one of the claims 1 to 11, wherein, preferably inside the razor handle (5), an electric power source, preferably in form of a rechargeable or replaceable battery (7) is provided.
- 15 13. Wet razor as claimed in one of the claims 1 to 12, wherein a sensor (11, 11', 11'') is provided which turns the oscillator circuit and/or the piezoceramic element (19) automatically on and/or off.
- 20 14. Wet razor as claimed in claim 13, wherein the oscillator (11) is arranged in the razor handle (5).
- 25 15. Wet razor as claimed in claim 13 or 14, wherein the Sensor (11) is provided preferably in the area of the razor head (1) in particular the area pointing towards the blade edge (15), preferably in the area of the interface (27) or in the area of the razor neck (3).
- 30 16. Wet razor as claimed in one of the claims 13 to 15, wherein the sensor (11) is a infrared or pressure sensor.
17. Wet razor as claimed in claim 16, wherein the casing of the razor handle (5) is infrared penetrable, at least in the area of the infrared sensor.
- 35 18. Wet razor as claimed in one of the claims 13 to 15, wherein, preferably in the area of the razor head (1) or the blade edge (15) respectively, a humidity sensor is provided (11').
19. Wet razor as claimed in one of the claims 1 to 17, wherein, instead of by means of the piezoceramic element (19), actuation is provided by electromagnetic means, in particular coils or miniature coils.